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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 99 MAY, 1927 No. 5

EDITORIAL

THE ORIGIN OF THE FRICTION MATCH

ANOTHER CENTENARY. Many of the inventions which we are using today have become so much a part of our life that we can scarcely imagine a condition of society without them. Presumably the telephone and automobile will occur to most persons as being the promptings of this remark but it has a humbler source. The ordinary match, the source of much convenience, unfortunately also of much damage, has now a history of a little over one hundred years. From an article in *Nature* (1927, **119**, 495) we learn that it was on April 7, 1827, that John Walker, a pharmacist of Stockton-on-Tees, recorded in his sales book the first sale of his newly-invented "Friction Lights." Scarcely anybody is now living who recollects the old flint and tinder days but some of us have heard in earlier years the stories of our ancestors as to the extreme annoyance and delay in getting a light in that manner. A distinguished professor of one of our medical schools said in his latter years that he had seen many of the inventions of the nineteenth century come into vogue but the friction match was to him the most acceptable. Further back of course we have the matchlock used by the soldiers, long ropes of combustible material kept burning in order to be ready to ignite the powder. It was with this kind of a weapon that the Puritan and the Cavalier armies fought in the Cromwellian days and we need not be surprised that the pious leader of the Puritan army gave the advice to his troops, "Trust in the Lord and keep your powder dry."

John Walker's match, of which a few specimens have fallen into the hands of Professor William A. Bone, F. R. S., on an examination

prove to be tipped with a mixture of potassium chlorate and antimonous sulphide made into a paste with gum and starch. In 1829 a notice appeared in the *Quarterly Journal of Science, Literature and Art,* under the title of "Instantaneous Light Apparatus," in which it is stated that Mr. Walker "supplies the purchaser with prepared matches, which are put up in tin boxes, but are not liable to change in the atmosphere, and also with a piece of fine glass-paper folded in two. Even a strong blow will not inflame the matches, because of the softness of the wood underneath, nor does rubbing upon wood or any common substance produce any effect except that of spoiling the match; but when one is pinched between the folds of the glass-paper, and suddenly drawn out, it is instantly inflamed."

Other claimants, of course, have appeared and very unfortunately in the Report of Juries of the Exhibition of 1851, Warren de la Rue and A. W. Hofmann stated that friction matches appeared about 1832 without even mentioning Walker's invention. The matches to which they alluded were known as "Congreves" and were introduced into England from Germany and Austria but were the invention of a French chemist, Charles Sauria. In 1913 Punch published a few verses in the honor of Walker but otherwise he has not received much glory from his fellow countrymen.

Considerable modification has been made in the nature of the match. Many persons still remember the old blue-tipped match with its sulphur coating and the excessively irritating character of the gas thus produced. The modern match is free from this objection.

When the new edition of "Four Thousand Years of Pharmacy" is in preparation it will be proper to record the service that was rendered by a British pharmacist about one hundred years ago in enabling mankind to dispense with the tinder-box.

H. L.

"A TIME OF NO WHISTLING AT ALL"

INTO the life of every whistling optimist must come a time of no whistling at all—and then the tune returns cheerier and warblier than ever it was before.

And I confess to a brand of optimism with a lilting whistle that perorates nigh perennially—the kind perhaps that "listens" better to the whistler but borders on boredom to other ears.

But the whistle for the nonce is a broken reed—and the elves of music are elsewhere expressing their joy.

All of this because the editor of an honored, old-time, professional journal—in company with a teacher in the oldest College of Pharmacy in the country—all in four and twenty hours, happened upon a quartet of circumstances—so disconcerting and so disappointing that the whistle simply would not function.

And no wonder it wouldn't whistle. Listen—this is an item from the testimony of one of the principals in the filthy murder case, recently ended (thank goodness) in the Long Island Courts:

"Where did she get this chloral hydrate poison?"

"From a druggist she knows,"

and

"Who told her about this poison?"

"Some doctor friend of hers."

That professional people, charged with sacred trusts should so blithely forget their responsibilities, is a fact gloomy enough to paralyze any whistle.

Why any druggist should dispense without discrimination such drugs as chloral, barbital, phenobarbital and the like is completely beyond our comprehension.

Most fortunately, however, the decent druggist—and that means the average druggist—regards his obligation in this respect—with a fine appreciation.

Were it not so, it would be high time to add to his burden of restrictive laws by legislating such dangerous drugs to a class with morphine and its kind.

But it took more than just that to complete our de-whistling.

There was the business of a chain drug store with a windowful of silk stockings for men and women and a sign that read: "Prescriptions Accurately Compounded."

Shades of Proctor and of Remington!

And an advertisement in a magazine famous for its listings of academic notices. Here it is. Believe it or not:

An Easy Way to Learn
PHARMACY
AT HOME

Graduate pharmacists are always in demand. The work is interesting and pleasant and salaries are good. Many young men open drug stores of their own and become independent.

There's an easy way to learn pharmacy right in your own home in spare time, without losing a day or a dollar from present work.

The . . . . Correspondence Schools course in Pharmacy supplies the knowledge which it will be necessary for you to have in order that you may pass your State Board Examination.

Just mark and mail the coupon printed below to the . . . Correspondence Schools, and full particulars about the Pharmacy Course will come speeding to you by return mail.

Page the Shades of the Old Masters again!

Then came the last straw that broke our poor whistle's back. It was the seeing in a public park of a patent medicine sign—rank with silly claims for therapeutic worth—yet with the asperity to wind up its message with this astounding legend:

"Recommended by All Reliable Druggists."

* * *

And so we say, that into the life of every whistling optimist must come a time of silence.

* * *

So do we repeat, too, what is already a fact since we thought and wrote this song of mourning—that circumstances so dispose themselves that after a while the tune returns cheerier and warblier than ever it was before. But that is another story.

Ivor Griffith.

SELECTED EDITORIAL

"ON APPROVAL"*

TO ALMOST every trader, at some time or other in his career, it is a matter of importance to decide what is the extent of his liability in respect of goods delivered to him "on approval" or "on sale or return." The answer to this problem depends, in a large measure, upon whether the goods have come to him with or without his consent. Usually, when goods are supplied "on approval" by mutual arrangement between the parties, the only question to be settled is, at what precise moment do they cease to be the property of the intending seller and become the property of the prospective buyer? Upon this point, the law is stated with reasonable clearness in Section 18, Rule 4, of the Sale of Goods Act, 1893, which provides as follows:

> "When goods are delivered to the buyer 'on approval' or 'on sale or return' or other similar terms, the property therein passes to the buyer (*a*) when he signifies his approval or acceptance to the seller or does any other act adopting the transaction; or (*b*) if he does not signify his approval or acceptance to the seller but retains the goods without giving notice of rejection, then, if a time has been fixed for the return of the goods, on the expiration of such time, and, if no time has been fixed, on the expiration of a reasonable time. What is a reasonable time is a question of fact."

It will be seen, therefore, that the goods belong to the intending seller until the potential buyer has forfeited his right to reject them by accepting them either expressly or by implication. Acceptance by implication may arise in either of two ways: (1) If the buyer sells the goods to a third party, pawns them, or deals with them in some other way which is consistent only with ownership; or (2) if he neglects to inform the seller that he does not wish to keep the goods. It should be noted that he is not bound to return the goods to the seller unless he has agreed to do so; but he must let the seller know that he has decided not to buy them. One other question that may arise when goods are in the custody of a possible buyer, with his concurrence, "on approval," or on similar terms, is this: What is the

*Reprinted from the *Pharm. Journal.*

extent of his responsibility for the safety of the goods until he either accepts them or returns them to the seller? It seems clear that as the arrangement is as much for his benefit as it is for the seller's, the buyer must look after the goods with ordinary care, so long as they are in his possession. That is to say, he need not take exceptional precautions for their preservation; but he must keep them with at least as much care as is shown by a man of ordinary prudence in looking after his own possessions. Far more perplexing is the problem that confronts a trader who has goods sent to him unsolicited. A parcel arrives, and upon opening it he finds that it contains goods sent to him "on approval" by some pushing firm without consulting his wishes or even considering his convenience. What are the legal obligations of the trader who finds himself the victim of this objectionable practice? Not long ago, a County Court judge stated emphatically that in the circumstances mentioned the unwilling recipient of the goods is justified in throwing them out into the open and leaving them unprotected. We disagree with this opinion, which conflicts with the principles of common law as expressed by the authorities. For instance, in Odgers' "Common Law of England" (p. 963) there appears the passage:

> "So if the goods of another be on A's land without his consent, it is his duty in the first place to communicate, if possible, with the owner of the goods and request him to remove them. If they be not removed within a reasonable time after notice, still he has no right to destroy them or do any act which will seriously damage them, unless their presence on his land becomes a material inconvenience which prevents the use and enjoyment of his property."

The position is that even if the goods come into the possession of the trader without his consent, or against his wish, the fact remains that they belong to the would-be seller who has certain rights of ownership in relation to them. It is not inconceivable that if the trader fails to give the seller notice of rejection, within a reasonable time, he might even be compelled to pay for the goods on the ground that he had impliedly accepted them. Naturally the trader is not bound to return the goods; nor is he under any liability for their safety; but he would not be justified in destroying them or deliberately exposing them to the risk of damage or deterioration. If the goods are of such a size or nature that their presence on his premises causes the trader serious inconvenience he would be justified in destroying them or

otherwise disposing of them upon the ground that they are a "nuisance." However, even in that event he should first give the owner a reasonable opportunity to remove them. On the whole, it seems that the trader who suffers the annoyance of having unordered goods thrust upon him will be well advised to curb his natural inclination to throw them on the scrap-heap, and, instead, find an odd corner for them until they are claimed by the owner. Moreover, if they are not claimed fairly soon, the trader should, to be on the safe side, notify the sender that he does not want the goods.

ORIGINAL ARTICLES

THE OCCLUSION OF BARIUM CHLORIDE BY BARIUM SULFATE*

By Frederick G. Germuth

IT IS A recognized fact in the laboratory that certain conditions tend to increase the occlusive properties of barium sulfate toward barium chloride, when the latter is employed as a precipitant in the determination of sulfur, sulfates and other forms of this element.

To endeavor to ascertain to what extent this process might be decreased by varying the conditions, particularly that of temperature, under which precipitation occurs, was the objective of the experimental work described in this paper.

Method

The *modus operandi*[1] consisted in adding to different concentrations of a soluble sulfate (sodium sulfate being utilized in the experiments), a calculated amount of barium chloride solution, of 10 per cent. strength. The salt used as the reagent was tested carefully as to purity, and corrections made for the difference in barium chloride content. This factor, though small, was taken into consideration. The amount of barium chloride in the solution was determined, and the volume added subsequently to the solutions treated rigidly controlled. The amount of sodium sulfate was also ascertained, and

*A contribution from the *Division of Research*, of the Bureau of Standards, Department of Public Works, Baltimore, Maryland.

corrections made for the small proportion of impurities in the c. p. article.

In the preparation of the experimental solutions, an amount of sodium sulfate was employed calculated to correspond in chemical equivalency to 0.1 gm. sulfur, in the first sample prepared, an increase of 0.1 gm. of sulfur being allowed in each sample, *e. g.*, an increase of 0.1 gm. in each sample over the one preceding it, and a corresponding increase of 100 per cent. concentration.

The first sample was diluted to 100 cc., and to each succeeding sample was added 25 cc. more of water (distilled) than the preceding one, making the volume of the tenth sample so treated, 325 cc.

To the first sample, 1 cc. of concentrated hydrochloric acid (sp. gr. 1.20) was added, and to each that followed 0.1 cc. in excess of the one ahead in the series. The barium chloride reagent was added slowly, drop by drop, in both the boiling and cold solutions of sodium sulfate.

The amount of barium chloride solution employed was always in slight excess of that amount required in the reaction, 1 cc. of 10 per cent. barium chloride solution being capable of precipitating 0.01416 gm. of sulfur.

After precipitation, the solution in each case was permitted to stand one and one-half hours after which filtration in a Gooch crucible under diminished pressure was resorted to, this procedure insuring, it is believed, greatest accuracy in the determinations.

The amount of barium chloride occluded by the precipitate of barium sulfate, in each case, was determined by comparing the actual weight of the ppt. of barium sulfate obtained after the essential operations of ignition, etc., with the weight of barium sulfate one would anticipate in the absence of occlusion and under most carefully guarded experimental conditions. The washings from these samples, including of course, the original filtrate, were tested for excess of barium chloride with H_2SO_4 and the results given in TABLE No. 1 give the differences existing, or the amount of barium chloride occluded by the ppt. of barium sulfate. This was accomplished by a nephelometric procedure in which the standards employed were prepared by the use of the indicated amount of c. p. barium sulfate required to show the turbidity produced by minute amounts of this compound. It will be observed that results were concordant in practically each case.

The first ten samples of sodium sulfate solution were heated to boiling, and an amount of the reagent slightly in excess of that required added. After treatment as outlined above, the following results were obtained:

TABLE NO. 1.

BOILING-HOT SOLUTIONS OF SODIUM SULFATE.

		Weight of barium sulfate in excess of that calculated.		*Weight of barium chloride occluded by precipitate.*
Sample #1.	(0.1 gm.)	0.0009 gm.	—	0.0008 gm.
Sample #2.	(0.2 gm.)	0.0008 gm.	—	0.0008 gm.
Sample #3.	(0.3 gm.)	0.0009 gm.	—	0.0009 gm.
Sample #4.	(0.4 gm.)	0.0010 gm.	—	0.0010 gm.
Sample #5.	(0.5 gm.)	0.0010 gm.	—	0.0011 gm.
Sample #6.	(0.6 gm.)	0.0010 gm.	—	0.0011 gm.
Sample #7.	(0.7 gm.)	0.0013 gm.	—	0.0013 gm.
Sample #8.	(0.8 gm.)	0.0015 gm.	—	0.0016 gm.
Sample #9.	(0.9 gm.)	0.0018 gm.	—	0.0019 gm.
Sample #10.	(1.0 gm.)	0.0020 gm.	—	0.0020 gm.

The next step consisted in treating cold solutions of sodium sulfate in the same proportions as those employed in the previous experiments, with slight excess of the reagent and the same amounts of hydrochloric acid. These, too, were allowed to stand one and one-half hours for complete subsidence and sedimentation and then treated precisely as the samples containing the hot solutions of sodium sulfate.

Table No. 2 enumerates the results obtained after treatment of the solutions:

TABLE NO. 2.

COLD (20° C.) SOLUTIONS OF SODIUM SULFATE.

		Weight of barium sulfate in excess of that calculated.		*Weight of barium chloride occluded by precipitate.*
Sample #1.	(0.1 gm.)	0.0005 gm.	—	0.0005 gm.
Sample #2.	(0.2 gm.)	0.0006 gm.	—	0.0006 gm.
Sample #3.	(0.3 gm.)	0.0006 gm.	—	0.0006 gm.
Sample #4.	(0.4 gm.)	0.0007 gm.	—	0.0007 gm.
Sample #5.	(0.5 gm.)	0.0009 gm.	—	0.0008 gm.
Sample #6.	(0.6 gm.)	0.0009 gm.	—	0.0009 gm.
Sample #7.	(0.7 gm.)	0.0009 gm.	—	0.0008 gm.
Sample #8.	(0.8 gm.)	0.0011 gm.	—	0.0010 gm.
Sample #9.	(0.9 gm.)	0.0011 gm.	—	0.0011 gm.
Sample #10.	(1.0 gm.)	0.0012 gm.	—	0.0012 gm.

The crystals obtained in the cold solutions were larger than those of the hot solutions, and were more easily filtered.

Summary

A consideration of the results given above would lead one to believe that the precipitation of barium sulfate in cold solution is preferable to that in hot solution, from the standpoint of accuracy.

While the differences existing between the two methods described are not great, they are significant.

It is a matter of general knowledge that this (the cold) method has given greater satisfaction than the other where the sulfur content of the sample is quite high—25 to 50 per cent.—and, apparently, it is the better also when lower concentrations of sulfur are encountered.

ON SOME CUPRAMMONIUM SALTS VII [1]

A Complex Thiosulphate

By David Wilbur Horn and Ruliff Edson Crawford

THE WORK of the senior author upon cuprammonium salts, at the time it was interrupted, aimed "to determine experimentally whether or not the largest number of ammonia groups that can combine with copper salts is a function of the *basicity* of the acid-residue." [2] Although hexa-ammonia salts are known for monobasic acids, no copper salt of a dibasic acid is known that contains more than five ammonia groups to each copper atom. The almost one-to-one correspondence between the tabular arrangement of the copper salts according to the "affinity" of the acid-radical present, and the tabular arrangement according to the maximum number of ammonia groups thus far known in the corresponding cuprammonium salts was already evident in the earlier work.[3] Extension of these earlier studies is desirable.

The known copper salts of dibasic acids are unique, as indicated above, and the beautiful salt described in the present paper resulted

[1] The earlier papers in this series appeared in the *American Chemical Journal* as follows: XXXII, 253-284, 1904; XXXV, 271-286, 1906; XXXVII, 467-483, 1907; XXXVIII, 475-489, 1907; XXXIX, 184-226, and 505-513, 1908.

[2] *Loc. cit.*, XXXIX, 191.

[3] *Loc. cit.*, XXXIX, 222.

from an endeavor to add to the list of cuprammonium salts of dibasic acids. From the point of view of systematics, this new compound has not as yet proven helpful. However it is so stable and so easily prepared and therefore so likely to be encountered by subsequent workers in this field, that it should be described.

Preparation of the Complex Thiosulphate

The first of the two solutions needed for this purpose was prepared by dissolving crystallized sodium thiosulphate, $Na_2S_2O_3+5H_2O$, in concentrated ammonia water as long as it dissolved freely. After filtering, the specific gravity of the solution was taken and found to be about 1.26 at 21°C. The other solution was prepared by pouring water upon an excess of copper chloride crystals, $CuCl_2+2H_2O$, shaking for a short time, and then filtering.

The complex thiosulphate results when any amount from one-twentieth to one-half a volume of the chloride solution is added to each volume of thiosulphate solution used. With the smallest proportion of copper chloride mentioned, a super-saturated solution results from which the complex salt crystallizes in time or immediately upon scratching the walls of the vessel with a glass rod. With the largest proportion, an inconveniently large amount of heat is evolved. Most of our material was prepared by adding one volume of copper chloride solution to every five volumes of ammoniacal thiosulphate solution.

After the mixture is cold the crystals of the complex thiosulphate are collected in a Buchner funnel, drained free from most of the adhering mother-liquor by placing successively upon piles of paper towels, and then dried in a desiccator over lime.

Under the microscope, the product appears uniform, and made up of broad blunt needles free from noticeable inclusions of mother-liquor.

Qualitative Analysis of the Complex Salt

Upon heating in a hard glass tube closed at one end, two sublimates are formed; the upper appeared to be sulphur and the lower appeared to be copper chloride. It is impossible to confirm the halogen in the usual way with silver nitrate, as will appear in what follows later. Upon heating with lime, ammonia is evolved. Of course the flame test for sodium is positive.

Quantitative Analysis: Methods

Chlorine was determined after the compound had been fused with a mixture of about four parts of anhydrous sodium carbonate and one part of sodium peroxide. The fused mass was extracted with hot water and carefully treated with nitric acid in excess. In this acid solution the chlorine was determined volumetrically by Volhardt's method.

Copper was determined by Rose's method, after the fact had been established that there was only a trace of halogen present. This method has previously been shown by one of us [4] to yield excellent results when applied to cuprammonium sulphates.

Sulphur was determined after the compound had been fused with a mixture of three parts by weight of "sodium-potassium carbonate" and two parts of potassium nitrate. The fused mass was extracted with hot water and carefully treated with hydrochloric acid in excess. The total sulphur was precipitated as barium sulphate.

Ammonia was determined by distilling the salt with an excess of sodium hydroxide, while a current of air was allowed to pass constantly through the apparatus. The ammonia was absorbed in tenth-normal sulphuric acid, and the excess titrated back in the usual way.

Volatile Matter was determined by heating in a double-walled bath with water boiling between its walls. The salt was heated in open crucibles.

Quantitative Analysis: Results

In presenting the following table of analytical results for copper, sulphur, chlorine and ammonia it may be of interest to note that they were all obtained by the junior author.[5] He was given the compound with general directions for its analysis but with no hint as to its complexity or its possible formula. The details of the fusion methods as applied to such a substance as this he worked out largely by himself. The substance had first been worked over by the senior author (casually, both qualitatively and quantitatively), who had found the same slight variations among his results for ammonia as are shown by the results of the junior author, who had obtained

[4] *Loc. cit.*, XXXII, 255.

[5] The analysis of this compound and the establishing of its empirical formula were assigned to the junior author as subjects for his thesis offered in partial fulfillment of the requirements at the Philadelphia College of Pharmacy and Science for the degree of B. S.

9.93% as the average for ammonia, and who had gotten 30.81% for sulphur by the Carius method.

Quantity of sample	*Quantity found*	*Percentage found by analysis*
CHLORINE:		
0.5002 gr.	0.27 cc KSCN	0.20% Cl
0.5002	0.07	0.05
0.5003	0.20	0.14
0.5009	0.30	0.22
0.5006	0.12	0.09
		0.14% average
COPPER:		
0.3003 gr.	0.1857 gr. Cu_2S	41.12% Cu
0.2014	0.1237	40.84
0.2033	0.1249	40.85
0.2004	0.1229	40.82
0.2050	0.1250	40.55
0.2001	0.1234	41.00
		40.85% average
SULPHUR:		
0.1022 gr.	0.2285 gr. $BaSO_4$	30.71% S
0.0974	0.2172	30.63
0.1020	0.2269	30.56
0.1997	0.4438	30.53
0.2003	0.4463	30.61
		30.61% average
AMMONIA:		
0.0948 gr.	4.55 cc. NaOH	9.75% NH_3
0.1027	4.65	9.54
0.0955	4.60	10.15
0.1004	4.90	10.29
0.1012	4.80	10.00
		9.94% average

Volatile Matter:

0.4965 gr.	0.0017 gr. loss	0.34%
0.2750	0.0010	0.36
		0.35% average

Properties and Formula

The color of the needles of this complex thiosulphate resembles closely the deep blue of the sulphate $CuSO_4.4NH_3.H_2O$. As indicated by the results of heating five hours at 100°C., they are stable in the air for such lengths of time as are needed in drying and handling them. However, it should be mentioned that a change in color to a greenish black ocurs upon heating although no appreciable loss in weight occurs. The needles are insoluble in water, and are decomposed slowly by it with the formation of a lighter blue precipitate. They are insoluble in concentrated ammonia water. In cold aqueous sodium thiosulphate solution they are insoluble, but by heating they dissolve with complete loss of color and with the evolution of ammonia; this solution in aqueous thiosulphate soon becomes a greenish-brown color as of copper sulphide. In *aqua regia,* in hydrochloric acid, and in nitric acid, a clear blue solution is readily obtained, provided each is first diluted 1:10 before the needles are placed in it. Upon heating any of these acid solutions, sulphur is precipitated as from a thiosulphate. Fuming nitric acid precipitates sulphur at once, and acts more violently in the presence of silver nitrate, *i. e.,* in the Carius method. By dissolving the needles in hydrochloric acid diluted 1:1 and adding bromine and heating, a clear acid solution may finally be obtained. Sodium peroxide in water oxidizes the salt and produces a blue precipitate resembling copper hydroxide, but the oxidation of the sulphur is incomplete as is shown by the fact that when nitric acid diluted 1:10 is added to dissolve the blue precipitate sulphur is precipitated and later a greenish-brown precipitate resembling copper sulphide forms. In a word, the complete oxidation of the sulphur is unexpectedly difficult to accomplish and this point adds considerable difficulty to the quantitative analysis.

When the *atomic ratios* are calculated from the analytical figures it is evident that there are two atoms of copper to every three

atoms of sulphur, whereas there are three ammonia groups to every five atoms of sulphur. These ratios establish the fact that this salt could not possibly be identical with the only other (complex or simple) cuprammonium thiosulphate[6] that is described in the literature known to us, for the corresponding ratios in it are 3 : 8 and 1 : 2. Moreover, the other salt is described as containing two molecules of sodium thiosulphate to every three atoms of copper.

The following table sets forth a comparison between the averages of the analytical results previously given in this paper, and the corresponding percentages of the constituents as calculated from the formula $Cu_{10}S_{15}O_{18}.9NH_3$:—

	Calculated by the formula $Cu_{10}S_{15}O_{18}.9NH_3$	*Average found by analysis*
% Copper	40.81	40.86
% Sulphur	30.86	30.61
% Ammonia	9.85	9.94
% Oxygen, by difference	18.48	18.45
% Chlorine	—	0.14
	100.00	100.00

Regarding the trace of chlorides that are present, we are inclined to suggest that in part they may consist of cuprammonium chloride, for in the analysis the copper and the ammonia run slightly high while the sulphur and the oxygen run slightly low. As to the copper, we have no doubt that it is in part reduced to the cuprous condition[7] for it is shown elsewhere in this paper that the needles are formed with the evolution of enough heat to make the solution very warm and also that the needles dissolve in hot solution of sodium thiosulphate undergoing reduction to a colorless condition. But we see no reason to venture at present upon any hypothetical formula that would imply knowledge as to the inner make-up of the molecule of this new complex cuprammonium thiosulphate.

[6] M. Peltzer described the salt $(Na_2S_2O_3)_2.Cu_2S_2O_3.CuS_2O_3.4NH_3$. See this JOURNAL, XXXVI, 376, 1864.

[7] See Mellor, "Comprehensive Treatise on Inorg. and Theor. Chemistry," Vol. III, 126. Longmans & Co., 1923.

ABSTRACTED AND REPRINTED ARTICLES

LIGHT AND HEALTH*

By Charles H. Mayo, M. D.

Rochester, Minnesota

I FEEL it an honor to have the opportunity to speak in The Franklin Institute, dedicated to the memory of one of the world's most distinguished citzens. Franklin was a truly scientific man, full of the enthusiasm of research, and he yet found the time to be one of the four fire chiefs of the city of Philadelphia, furnishing his six leather water buckets and two cloth bags for salvage from burning houses.

The more one investigates cause and effect in the universe and the development of the world, the more respect one has for those ancient peoples of Central America, Egypt, and other countries who worshipped the sun. We pass over their sacrificial efforts to appease the wrath of the sun and win his favor since they are in harmony with many religious cults, in which the sufferers are sustained by the glory of martyrdom. Modern wars of civilized men are more destructive without doubt; those who are the greatest leaders in destruction become heroes. Concerning our universe there is little doubt that Chamberlain's theory is most acceptable, and that the sun's planetary system (of which we are a part) came from a most ancient near-accident to old Sol when another star body passed near and encircled it, without actually touching it, and caused the immediate development of such great heat that a number of masses were thrown off from it. The planets and satellites of these gaseous masses, made round by rotation and gravity, have since been cooling, each according to its size, as an enormous period of time has passed since that occasion. Mars probably has now about the climate of New York City. The period of the earth in its orbit is one year, while Neptune, so great is its orbit, has made the trip about the sun but eleven times since the birth of Christ.

Physicists, geologists and biologists have discussed the millions

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of years of time which have been required for the formation of the present stage of evolution and development much as if such eons were but minutes of the present. Sunlight has taken a comparatively short time to reach us, coming at the rate of 186,000 miles a second. It takes eight minutes and twenty seconds to make the trip of ninety-three million miles from the sun to the earth. Our sun is one of the smaller suns, that is, the stars emitting light, being more condensed than some which are larger. The earth, in comparison with the sun, would be but a grain of sand at twenty-three feet from it when the sun is represented by a tennis ball; the next nearest sun, another tennis ball, would be 1100 miles away. Only three suns other than our own are within ten light years of the earth, and from the nearest of them it would take four and a half years for the light to come to us. The space separating our solar system from the other suns is very great, considering the difference in time for their light rays to reach us compared with those from our sun. In fact, all life has been and is dependent on the sun as it goes on through the ages emitting radiant energy. Professor Russell says the sun will give satisfactory rays for another billion years, which relieves some of our worry. The heat rays from the sun are capable of being measured. It is giving off energy equivalent to the burning of billions of tons of coal each second, and we are getting only a small part of it. The heat received from the sun by the entire surface of the earth is equivalent to the burning of two million tons of coal every second. The heat from one hundred million of the stars (or suns) would not here raise the water in a thimble one degree in one hundred years. We have a universe, the bodies in which are slowly contracting, yet our earth that some think of as large for practical purposes is as much smaller as the rapidity of travel has increased in fifty years; a few decades ago it took weeks to sail to Europe but now it takes only a few days. On land we had the horse, then came the rails, and now the automobile. The earth rolls on at the same old speed, and in just the degree that man's speed has developed in the last fifty, or one hundred, years actually to encompass it, just so much smaller may we consider our world and so much more interesting is it as we can visualize it in thought. Man has gradually come into control of the world's forces principally by making use of the stored energy of the sun and its ever-present activity. The stored energy of the sun is in the form

of coal which developed when a very different atmosphere existed, heavily charged with carbon, and giant rushes and masses of tropical growth, trees, ferns and grass, made enormous beds of deposits which, under pressure of layers of earth and rock, ultimately formed coal of various degrees of hardness. Lignite is half-formed coal produced when that age was passing, and peat, found in our northern marshes, the still less formed carbonaceus material of the present period. Such material, including wood, is capable of disorganization by fire, as it combines with oxygen. It thus gives up that heat in a short time which it was a long time in acquiring from the sun, gives back its carbon to the air and its minerals as a residue of ash. Water-power, or white coal, represents the rapid action of the sun. The energy of the sun stored in water as it is lifted by evaporation is released in the falling rain and the flowing river and can be transformed at man's desire and under his control.

In America we have made the greatest use of the sun's energy, and man's industrial labor is now backed by over sixty horsepower. The marvellous imagination of Jules Verne vividly recorded in his novels has, in fact, been surpassed by train and automobile, by airship, and both on and beneath the sea. However, the smaller our world, the greater is the interest taken in it and all that there is of life of every sort on earth. Our enjoyment of it comes from the sun.

Since the electronic theory was formulated, scientists have determined that our world is composed of thousands of combinations, 250,000 being known, of the ninety-two elements, with the first or lightest as hydrogen and the heaviest, uranium, number ninety-two. Of these elements ninety are now known and each of these elements drops into a pigeon-hole of numbered negative electrons or planets, so to speak, which compose its atom as a universe, and with positive electrons equal in number to its atomic weight, which as protons make up its nucleus or sun. As Rutherford says, the size of the atom is equal in extent to the maximal-sized orbit of its negative electrons. It was Franklin who divided electric charges into positive and negative. To name them now they would be reversed. The fewer the movable electrons the more stable the material. The structure of the two missing elements is known, namely, those numbered 85 and 87, but the actual substances are still elusive. Only ninety-two electrons may be held together and those of high numbers are slowly breaking up of themselves;

thus uranium breaks up into lead and radium, which is one hundred times more active, or again radium disintegrates into other radio-active forms, A, B, and C, and helium and lead; others can be changed by knocking an atom of hydrogen, the master element, out of them with powerful X-ray radiant energy. The iron core of the earth's centre approximates 4000 miles in diameter and is thus eight times larger than the moon. It is true that by absorption we gradually accumulate more from the radiant energy of the sun's heat waves alone than we lose.

All material has its specific atomic structure, even its definite electronic chemical combinations with other elements. Living material has its own electronic combination and activity of structure which is not necessarily the same as the ordinary combination of such elements but becomes so after death, with loss of radiant energy. Life, then, is more or less electric, and varyingly active, oxidative and chemical. Almost perfect acting cells are made chemically and resemble the living in some activities, especially in causing crystalline formation. Bacteria, ultra-microscopic, or larger and of molecular dimensions, may act as electrons of varying energy. Few, possibly 5 per cent., of the great mass of bacteria, which are the active living chemists of the world in nature, are destructive to living tissue. The most common forms of life in the sea are the bacteria engaged in forming limestone from the calcium in sea water. They work in sunlight and warmth now as in the Cambrian period of the world's history; in the strata laid down at that time the fossilized remains of the pre-Cambrian and Cambrian invertebrate life are held for our inspection.

It is but lately that we have appreciated radiant energy although it was only about two hundred and fifty years ago that the sunlight was first broken by Sir Isaac Newton's prisms into its bands of light from violet to red. The visible rays represent but a fraction of the spectrum. Now we know that the heat waves lie in the red and intra-red regions and next come the radio waves which are many metres long and then the alternating electric current with some waves many kilometres long. At the other end of the visible spectrum is violet, and beyond the visible violet comes ultra-violet, then radium rays and X-ray with still shorter waves. The waves of the visible spectrum are measured by the millionth of millimetre length and run from about 400 to 800 millimicrons (violet to red, through the blue, green and yellow), or by the Angström units (a ten-mil-

lionth of a millimetre) from approximately 4000 to 8000. Certain wave-lengths of ultra-violet rays are most important in stimulating the chlorophyl (which is the green of plant life), the hemoglobin of blood-cells (which, in thin layers, are also green), and the photo-sensitive plate. The ultra-violet is the most stimulating and is held by the tissues of the skin while shorter and longer waves at both ends of radiant energy pass through or are absorbed by the body. Thus red glass holds back all but the red waves of the light or visible spectrum and passes a considerable quantity of heat waves. Ultra-violet causes the cells of the skin to protect their nuclei rapidly by screening with melanin, or the so-called tan of sunburn. Such rays lower blood-pressure from 7 to 10 per cent., somewhat increase the oxygen of the blood and blood calcium, the activity of endocrine glands, and the storage of iodine by the thyroid. This is of great importance as the blood carries the same fourteen primary elements that good soil does for plant life. The ultra-violet increases vitamin A; in fact can develop it in linseed oil exposed to the ray. Cod-liver oil has a large amount of this vitamin. Thus the violet ray of the sun prevents and cures rickets, which is so prevalent among the children of Scotland with its fog and and clouds and smoky air, as it is approximately only for one-half year that they have much chance with old Doctor Sunshine.

Fortunately man's ingenuity has developed the quartz glass (or fused quartz) which permits the ultra-violet ray to pass. Celluloid and paraffined gauze are also somewhat permeable to it while common window-glass cuts out most of it. Thus the mercury-vapor quartz-lamp, or arc light with carbons combined with nickel, emits a large amount of ultra-violet which can be used in the treatment of chronic diseases, especially tuberculosis of the lungs and joints. The greatest effect of ultra-violet from sunlight is obtained at midday as the rays pass through the thinnest layer of air over the earth. The long slanting rays of morning and afternoon are largely screened by the air, especially because of the average half-inch layer of water diffused in hydroscopic form throughout the air. Thus high mountain altitudes are used in order that such sun treatments shall be most effective, although ultra-violet treatments are of value for shorter periods in any place, and artificial ultra-violet light can be created where nature gives little or no aid with sunlight. The ultra-violet which can be transmitted through air covers one and one-half octaves of light radiation, and

one of the most destructive bactericidal regions of ultra-violet light is just below the very limit of the solar spectrum, that is 2800 to 2900 Angströms. The ultra-violet stimulates chemical reactions without heat, which would otherwise require great heat to accomplish.

Water with carbon dioxide gas bubbling through it can be made into a hydrocarbon derivative formaldehyde. CH_2O, being formed by exposures to ultra-violet rays. Sugar is chemically but twelve parts of carbon with eleven of water. Sunlight acting on the chlorophyl of the leaf makes starch, $C_6H_{12}O_6$, while cellulose is formed by a loss of a molecule of water, as the leaf unloads its burden of starch to the tree trunk at night.

The first recorded use of light in medical treatment was at Margate, in 1715, by Russell, who was stimulated to its use by watching the self-treatment of diseased animals. Finsen, of Copenhagen, gave it prominence in 1893, in the so-called Finsen ray; later Bernhard, in 1902, repeated the work by the employment of sunlight in the mountains of Switzerland for pulmonary tuberculosis; and in 1904, at Leysin in Switzerland, Rollier, finding that the treatment of tuberculosis of the lungs by heliotherapy under the directions of Bernhard was generally successful, started its use for the cure of so-called surgical tuberculosis, that is tuberculosis of bones, joints, glands, intestine, peritoneum and sinuses. The method is not a cure-all, but used with judgment and care may give surprisingly beneficial results. Those whose skins do not readily tan do not do as well as those whose skin quickly forms its melanin protection of the cell nucleus. In commencing treatment, the feet are exposed for a few minutes for a day or two, in a few days the lower half of the legs, then later the legs to the knees, and ultimately the whole body. The time of day the skin is exposed makes a great difference as that light which gives the quickest photographic action has the greatest healing power.

The ultra-violet rays are destructive to skin if used without care. Probably this chemical reaction which is concerned in the destructive effects of the suns rays on the skin in severe sunburn with blistering, destruction of skin and fever, consists of the formation of formaldehyde in the skin.

Hematoporphyrin made from blood and injected into the blood of the Caucassian makes him sensitive to light and may cause death in the sunlight, although without effect in the dark. Phyloporphyrin

is its vegetable counterpart from certain foods like buckwheat; it causes local skin reactions in man and white-skinned animals when they are exposed to sunlight. When carefully used this produces no reaction, yet the effect of continued or repeated small doses is undoubtedly to develop resistance of the blood and tissue against some chronic and a few acute diseases.

The light of the ordinary incandescent bulb is due to a filament of carbon which is resistant to the passage of the current. The filament would burn up if oxygen were in the bulb, but it operates in a vacuum or a bulb partly filled with inert gas. Diathermy is a method of heating living tissues to a considerable depth by electric current (as in the case of the lamp) to a temperature much greater in the centre of a joint or muscle than can be obtained by superficial treatment. This temperature is greater than many of the germs of disease can withstand, and the process is similar to the pasteurizing of milk for thirty minutes at a temperature between 140° and 145° F. Such treatments are very effective in certain acute and chronic inflammations of muscles and joints, especially those caused by bacteria, as many bacteria are active in but a small range of temperature.

The essential elements when volatilized at high temperatures emit characteristic radiations. The spectrum of the sun's rays shows that the same elements which make up our earth are also present in the sun and this fact is one of the proofs of the earth's origin. Scientists were twenty-seven years studying a special band in the sun's spectrum, which they called "helium," before this element was finally found on earth. We now know that it can be produced by the disintegration of radio-active substances, and is found both in the earth and in the sun.

Some recent writing on vision by Shastid call our attention to the development of vision. The amœba is usually selected as the example of a complete, active and industrious single cell. This cell opens at any point to engulf food and again opens at any point to pass out the waste. It moves by developing feet at will and changing shape, closing its projections and making new ones, the granules of its protoplasm serving within the cell as the endocrine glands of multi-cellular bodies. This cell is light-sensitive all over and is moved to action by it. The microbic *Euglena viridis* has a mouth near which is a red spot, sensitive to light and heat, the first eye. Later, eyes were placed in sockets, a condition found in some

worms. These afterward filled with foreign material. As evolution advanced, the socket containing the sensitive spot was filled with a viscid substance, eye-fluid, which was often contaminated but which was later covered, in other forms of more advanced life, so that a cornea of a double convex form was developed. Later still came lids: These first appeared in fishes, but they were structurally incomplete.

Birds have the most wonderful eyes, which can be adjusted as telescopic eyes for great distances, with double sensitive retinal spots or foveæ. Thus the vulture and buzzard are called to the feast by sight, and not smell, which is but poor in them. In general it can be said that the sight of birds is far better than man's, being microscopic and telescopic. There are no blood-vessels in the retina; they see no blue and violet but see by the infra-red and red. In snakes the lids are transparent but are fused together. As the snake grows, this lid skin becomes cloudy and is cast off with the skin as the reptile grows and requires a new one. The snake has vertical inner eyelids. Since it is nearsighted, it sees objects only in motion; having poor vision at the best and being nearly deaf as well, it receives most outside impressions from the delicate forked tongue. Cats and owls control at will their pupils which are vertical for watching for birds up and down trees. Dodson says to those who love birds that the predatory cat makes good roses when buried beneath the rose bush. The horse has a transverse pupil; he can see behind to kick with but has little eye movement. The sun has burned out the lower part of his retina and he sees little except below the eye level; in fact he often bumps his head when passing through doorways.

Undoubtedly eyes were first developed in sea life and evolved with many adaptations to environment. Some years ago I received several thousand small trout fry. These were placed in large tanks with running spring water and fed fine chopped liver. They were always quite hungry, although gradually much food accumulated in the bottom of the tank. When I stirred this up with a stick they took advantage of the opportunity to eat. Examining the trout of all sizes I found the lower lip a little longer than the upper; they could easily grasp what was over them but not under them. Their eyes were so placed as to see above and not below; a true game fish, living on insects or small fish and possessing sharp teeth. On the other hand, the sucker is an opposite type; the eyes

are placed lower to see below, the upper lip longer and mouth turned down. Suckers were put in with the trout to keep the water clean, for they are scavengers without teeth and also partly live on vegetable food. By examining fish from such a standpoint one can tell whether the flesh will be palatable as it is in trout or less so as in carp or suckers. Fishes with large eyes are found near the surface. In fishes a falciform ligament is attached to the back of the lens and to the back of the eye for focusing. They have no color vision. This fact will be disputed by those who sell artificial flies at high prices. When living confined to the dark water of caves fishes' eyes nearly or quite disappear and fishes at great depth in the sea, where little light penetrates, have small eyes and poor eyesight. Exposing such cave-fish to red rays will develop the eyes in one generation.

The housefly has both compound and single eyes, the compound ones being used for vision at a distance of some yards. Each eyebulb has 4000 hexaform tubes, a nerve with pigment at the base in each tube and a double convex cornea over each. Between the compound eyes are three single eyes for use in near vision, at one or two inches.

It is certain that man's eyes were made for distant vision, chiefly required when he was an outdoor animal. Now he lives in the "grand canyons" of the city streets or passes his life indoors and as age comes on, or even before, he needs glasses for reading, and makes but little use of his distant vision. Samuel Pepys in the seventeenth century gave up the personal writing of his interesting diary in his late thirties for lack of glasses. Many people are color blind and may see red only as a gray. Man with his need for near work and town life, reading and studying, is growing to use the eyes for the most part in near vision. He must have better accommodation from his lenses; the need should develop it. In city life he sadly misses the third eye in the back of his head, which is now but a vestigial structure, the pineal gland. Some species of life have a poorly formed third eye which disappears during the early period of life; the tuatara, a native lizard of New Zealand, has such a third pineal eye which persists throughout life and is the only one of this type that is found at the present time. The giant lipoid has a hole in the back of his skull for such an eye. Non-primates have no, or little, overlapping of the visual fields of the two eyes and no stereoscopic vision; many have a third eyelid, or membrane nictitans,

like the horse, for cleansing the cornea of dust. All primates have a macula or good spot of vision. The vision of man is usually best in the right eye unless he is left-handed. The eyes of man are probably growing closer together; in the early embryonic life they are set wide apart, as in the horse. Shastid says that eventually both may rest in one socket; this may be a cause of argument in a half million years.

In a democracy the mass of the people are dependent on city officials for health protection. Seventy per cent. of the people of this country are now residents of the city and their needs should not be based on the working necessities of the 30 per cent. of farmers who are opposed to daylight saving. Those in the eastern portion more generally can be thankful to their officials who have put in daylight saving, making it possible for the children to receive more sunshine, and grown-ups a long evening and more contact with nature.

NOTES ON THE FUCHSIN-SULFUROUS ACID TEST*

By Henry Leffmann and Max Trumper

THIS TEST has acquired much importance of late years from its use in the official process for detecting methanol, which is liable to be present in alcohol recovered from the commercial denatured form. The procedure given in the current U. S. Pharmacopeia (X) is based on the comprehensive investigation by LaWall (Trans., Wagner Free Inst. Sci., 1923, 10, 55; reprinted in *Amer. J. Pharm.*, 1923, 95, 812). The procedure has given entire satisfaction, but LaWall found that glycerol will respond to the test and, therefore, in dealing with alcoholic liquids other than plain spirits, distillation is necessary (*Amer. J. Pharm.*, 1924, 96, 226).

The fact that a rosaniline salt bleached by sulfurous acid will acquire a deep color by action of aldehyde was first pointed out by Hugo Schiff in a comprehensive paper in *Ann.* 1866, 140, 132. The reaction for the bleaching was given as follows:

$$C_{20}H_{19}N_3 + H_2SO_3 + H_2O \rightarrow C_{20}H_{21}N_3 + H_2SO_4$$

The color of the dye is not restored, but a deep characteristic color is formed which makes the test very delicate. Formaldehyde,

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for the detection of which the test is now mostly employed, was not known when Schiff published his paper, having been first produced by A. W. Hofmann in 1867 (*Proc. Roy. Soc.*, 1867-68, 16 156; also *Chem. News,* 1867, 16, 285). In 1914, H. Fincke published in *Zeitschr. Unter. Nahr. Genuss.* (1914, 27, 246) the results of investigations that led him to modify the method of preparing the bleached rosaniline solution, claiming that the new formula gives a reagent specific for formaldehyde. The formula has, in fact undergone a number of modifications, but the main features have been preserved being the production of a leucaniline by the hydrogenation (reduction) of the dye as shown above. The common salts of rosaniline—acetate and hydrochloride—are used in preparing the reagent. Some formulas prescribe sodium sulfite, some the acid salt. Fincke claimed special advantage in the use of a much larger proportion of hydrochloric acid than in the solutions as commonly made up, and also as an item not be overlooked, the addition to the solution to be tested of from 1 to 2 c.c. of the same acid before adding the reagent. Sabalitschka and Harnisch, in a recent long and very thorough review of the tests that have been proposed for formaldehyde, name Fincke's method as characteristic. It is stated that even if acetaldehyde produces a color, it fades in a few hours while that of formaldehyde remains for a long while.

The application of Fincke's solution and the investigation by Sabilitschka and Harnish relate solely to the detection of formaldehyde ready-formed, that is, by addition as in foods, but the inquiry here presented is the use of the solution in the detection of methanol by the standard oxidation process, which is, in this country at least, the most frequent requirement. Comparisons have been made with solutions prepared according to U. S. P. IX and X and Fincke's suggestion.

U. S. P. IX

Fuchsin	0.50 gm.
Sodium acid sulfite	9.0 "
Water	500. c.c.

To this solution add 10 c.c. of hydrochloric acid, sp. gr. 1.12.

U. S. P. X

Fuchsin	0.2 gm.
Hot Water	120 c.c.

after the dye is dissolved, cool the liquid and add

Sodium sulfite (dry)	2.0 gm.
Water	20 c.c.

Then 2 c.c. of hydrochloric acid, sp. gr. 1.12 and dilute the liquid to 200 c.c.

Fincke's reagent.

Fuchsin	1.0 gm.
Sodium sulfite (dry)	12.5 "
Hydrochloric acid (1.12)	15 c.c.

These substances are to be dissolved in 500 c.c. of water and then diluted to 1000 c.c.

The solution at first colored soon bleaches and is ready for use. It is stated to keep well in closed containers.

From 1 to 2 c.c. of hydrochloric acid (1.12) must be added to the liquid to be tested before the reagent.

Tests have been made by us on dilute solutions of ethanol, methanol and glycerol, with the three reagents. The change of formula of U. S. P. IX to that of U. S. P. X is stated to have been made to conform to the reagent recommended by the A. O. A. C., but that reagent is directed to be made with a solution of sulfurous acid of definite strength. Solution U. S. P. IX has seemed to us more satisfactory than that directed by X being more rapid in reaching a straw yellow and keeping very well even under ordinary laboratory conditions. Fincke's reagent, as noted above, is stated to give no color, or only a transient one, with acetaldehyde, but a permanent one with formaldehyde. This has been confirmed, and in applying the test to ethyl alcohol according to the procedure of X no color was obtained with the Fincke's reagent, but a small amount of glycerol without either methanol or ethanol gave a very distinct blue which would be, of course, mistaken for the methanol reaction. It appears, therefore, that while Fincke's reagent has some advantages it does not eliminate the fallacy which LaWall discovered, and distillation of alcoholic liquors is necessary, except when plain spirits are under examination.

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THE DUCTLESS (ENDOCRINE) GLANDS*

THE HIGHER animals possess a number of glandular structures, such as the liver and pancreas, which have ducts and the functions of which are direct, especially in connection with digestion. Other structures of a glandular nature exist which produce no visible secretion, that is, none that flows into any mucous cavity of the body. The functions of the "ductless" (internal secretion) glands have long been problems, but extensive experimenting and clinical observation have cleared up much of the obscurity.

At a recent meeting of educators the "Schoolmen's Week Association," papers were read and discussed, before the Section on Chemistry, Physics and Biology, in which the principal points concerning the functions of these glands were set forth. The meeting was held at the University of Pennsylvania, Dr. Wilmer Krusen, Director, Department of Health of Philadelphia, presiding.

Dr. Samuel T. Gordy, of the staff of the Philadelphia Hospital for Mental Diseases, read a paper on

The Endocrine Glands and Their Secretions

of which the following is an abstract:

Only in the past twenty-five years has sufficient knowledge accumulated on the basis of observation and experiment to give a fair notion of the functions of the glands of internal secretion. They are factories highly specialized for the manufacture of very potent substances that regulate the chemistry of our lives. Chemists have been able to make some of these artificially, for example, thyroxin, the active principle of the thyroid gland, and adrenalin, one of the active principles of the adrenal gland. In many instances chemists have been able to prepare from lower animals very potent extracts which replace the action of these glands when they are lacking, for example, parathyroid extract known as parathormone, pituitary extract known as pituitrin, and pancreatic extract known as insulin. The glands act as a biologic league of nations to keep our various functions harmonious. They act as the chemical twin sister to the nervous system in co-ordinating our bodily activities.

If there is not enough thyroid in early life, dwarfism and idiocy result. Several grains of dried thyroid will convert a thick-lipped,

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pot-bellied, heavy-featured, idiotic cretin into a well proportioned, normal, alert child. Thyroid also regulates the production of animal heat, in other words regulates the draught of the furnace of life.

The adrenal glands, one above each kidney, manufacture adrenalin. It is a sort of energizing principle enabling us to do physical work and combat fatigue with greater efficiency. It operates when the organism is under special stress to mobilize all the body forces calculated to fit the animal for putting up a good fight or run from its enemies. It is the gland of combat or flight. Endurance is not only a matter of strong muscles and good wind—it requires good adrenal tissue.

The parathyroids regulate the amount of lime salts in the blood. If they are removed the animal will go into convulsions, which may be promptly relieved by the use of parathyroid extract.

The pituitary, located at the base of the brain, has much to do with our height, weight, and general contour. The seven- and eight-foot giants that we see in the circus and read about, all had an excess of pituitary secretion in their early teens. Certain types of fatness are due to disturbance of this gland. The changes in Napoleon from the thin artillery officer to the rather rotund emperor were probably due to pituitary disfunction. Dickens in "Pickwick Papers" gives us a typical picture of pituitary disease in the fat boy who always fell asleep. When the groundhog goes into winter quarters, the pituitary is taking a vacation.

From the pancreas or sweetbread, insulin is obtained, a constant supply of which is necessary to keep us all from becoming sufferers from diabetes. When our own supply fails, we can now, thanks to the remarkable work of Banting and Best of Toronto, supply our deficiency from insulin obtained from lower animals.

Our latter day Ponce de Leons who are looking to reclaim their lost vigor and youth by various rejuvenation operations and monkey gland transplantations have not been pre-eminently successful in their search, despite early, much touted claims.

Richet says, "The living being is a chemical mechanism and perhaps it is nothing more." Modern biophysics and biochemistry show more and more how our daily life is subject to the operation of general laws that operate throughout the whole of life. There is a great wilderness of ignorance to be explored. Only the fringe of the virgin forest has been cleared, and we are still in the pioneer days of discovery. Perhaps some day what we call personality will yield to strict scientific measurement.

Abstract of a Discussion on "The Internal Secretions and Human Behavior," by Dr. Henry E. Starr, Department of Psychology, University of Pennsylvania

The realization of the importance of internal secretions may be said to date back 400 years ago to Paracelsus, who observed that the well being of the human organism depends largely upon the nature of the material "distilled" from one organ into another. The development has been slow. Today there is a tendency to think we know more about the subject than we do. For there is wide circulation of popular treatises on the glands, which are replete with misinformation and romantic fiction.

The sympathetic nervous system, involving as it does the glands of internal secretion, is the most primitive part of man's nervous organization, and with it are interwoven the primordial determinants of all behavior—motivation and available energy. With the latter, the thyroid has, directly, much to do. Upon the adequate functioning of this gland depends, to a large degree, the alertness of the individual, his capability for intellectual effort and intelligent performance, etc. The parathyroids appear to function normally as stabilizers of the performance level. The pituitary, with its dual structure and manifold functions, is psychologically a fascinating mystery. So also is the thymus, the so-called "gland of childhood," which has not been definitely proven to secrete anything. As to the adrenals, the effect is to give the individual more immediately available energy in times of stress.

All of the glands thus far studied are most closely interwoven in chemical and functional relationship. Research on metabolism and behavior in the Psychological Clinic of the University of Pennsylvania, with especial reference to hyper-excitable children, indicates the importance of the adrenals in many such cases, as well as involvement of the thyroid.

There must be an adequate synchronization of all of the glands for the production of normal behavior. Just as there is a psychology of individual differences, known as clinical psychology, so there is also a biochemistry and an endocrinology of individual difference being developed. Each must be employed in connection with the other that the aim of Orthogenics may be attained—"the normal development of every child."

THE LISTER CENTENARY*

REPRESENTATIVES of surgery from the whole world united with all that is eminent in English life in celebrating the centenary of Lord Lister's birth. The keynote of the proceeding may be epitomized in the well-known words of the American ambassador, Mr. Bayard, addressed to Lister in proposing his health at a Royal Society banquet. "My lord," said he, "it is not a profession, it is not a nation, it is humanity itself which, with uncovered head, salutes you." These words were quoted more than once in the addresses. It was fitting that Glasgow should open the celebrations, as it was during the period 1860-1869, while professor of surgery at that university, that Lister introduced his antiseptic system. All sections of the community, medical, religious, academic and municipal, joined in the tribute. The celebrations opened with a commemoration service in the cathedral, attended by representatives of fifty public and scientific bodies. Rev. Dr. Lauchlan MacLean Watt, the minister of the cathedral, in the course of a tribute described Lister as one of God's greatest gifts to man. After the service the delegates taking part in the celebrations were entertained at luncheon in the city chambers by the lord provost and the corporation. Sir John Bland-Sutton, ex-president of the Royal College of Surgeons, delivered an oration in memory of Lister. After describing Lister's great advance, he made a remarkable forecast: "This is not the end," said he. "The legitimate function of surgery is the repair of physical injuries. Morbid growths must be cured by drugs prepared by biochemists. Chemotherapy and physics, which have furnished medicine with powerful and reliable remedies, will help to deliver mankind from some of the most distressing and unpromising operations of modern surgery. There are clear signs of the dawn of such an era."

Reception at Buckingham Palace

The king received at Buckingham Palace about a hundred delegates from all parts of the civilized world. An address, presented to the king by Sir Ernest Rutherford, president of the Royal Society, described Lord Lister as one of the greatest benefactors of the human race. His brilliant powers as an investigator and his single-minded

*Reprinted from *Jour. Amer. Med. Assoc., 88,* 1508, 1927.

devotion to science enabled him, in applying to the problems of surgery the discoveries of his great contemporary Pasteur, to lay bare the hidden causes of septic inflammation, to discover the means of its prevention, and thereby to inaugurate a new epoch in the science and practice of surgery. "It may well be doubted," it went on, "whether the scientific activity of any other one man has achieved so much for the saving of human life and for the prevention and relief of the physical suffering which afflict mankind." The king, in reply, said that any country might be proud to claim Lister as its citizen. He welcomed the representatives of medical and surgical science, both from the dominions overseas and from all parts of the civilized world who came to join in honoring his memory.

Lister's Early Life

Before the Royal Society of Medicine, Sir St. Clair Thomson gave an address entitled "A House Surgeon's Memories." He said that Lister achieved more for mankind than all the surgeons from the beginning of history. Before his coming the results of surgical wounds were hardly better than in the dark ages, and yet he lived to see his work and teaching result in the saving of more lives than had been destroyed by all the military heroes of all the ages. Lister was of pure English stock. His people came from Yorkshire. His father was a prosperous wine merchant in London, from whom he inherited other things besides a competence. Among these was a taste for scientific pursuits. The wine merchant was deeply interested in the science of optics; he helped to perfect the microscope and was a fellow of the Royal Society. In 1853, at the age of twenty-six, Lister went to Edinburgh, and at the early age of thirty-three he was called to fill the chair of surgery in the University of Glasgow. There he remained until 1869, when he returned to Edinburgh as professor of surgery in the university.

His Work in London

In 1877 Lister was invited to London. He accepted the invitation solely because he felt that on the larger and more central stage of the metropolis he could so demonstrate his work that he would the sooner fulfil his mission and win the whole world to accept his principles. In taking leave of his class in Edinburgh he announced that it was only a sense of duty that impelled him to leave a school where

he had received great kindness, and to take a cold plunge into what he said "might prove to be a sea of troubles." He was indeed right; a cold and stormy sea of trouble was awaiting him in London. In Edinburgh Lister's class frequently numbered 400 students; in London some ten to twenty might turn up, but these gradually fell off. Ten years after his arrival Lister referred to his small classes after his crowded audiences at Edinburgh as "a humiliating experience."

Sir St. Clair Thomson thought the faulty method of teaching and examination had much to do with this result. Lister's teaching did not help a man much to pass an examination and secure a diploma. It was more difficult to suggest why London surgeons neglected or belittled his work. One was that the discoveries of Pasteur, on which Lister's conceptions of wound infection were based, were too recent to be understood as the basis of his principles. Bacteriology had hardly come into existence. Another possible reason was that Lister had, by way of experiment, to try many things in his application of these principles to wound dressing. But if students and London surgeons were apathetic over the revolution in surgery being wrought in their very midst, it was not so with foreigners, who in 1883 poured into King's College Hospital from the end of the earth. Yet a well-known surgeon—a fellow of the Royal Society and a president of the Royal College of Surgeons—frequently raised a laugh by telling any one who came into his operating theatre to shut the door quickly, in case "one of Mr. Lister's microbes should come in." One day, in 1883, after Lister had been six years in London, standing on the steps of the hospital Sir St. Clair was discussing with Lister the attack made on him for having the temerity to open a healthy knee joint. Lister began by quietly remarking that the day must surely come when the profession would accept his methods, "and" he added warmly, "if the profession does not recognize them, the public will learn of them, and the law will insist on them." Then placing his hand on Sir St. Clair's shoulder, he continued, "Thomson, I do not expect to live to see that day, but you may." Lister did more for surgery in his lifetime than all the surgeons of all the ages had effected since the days of Hippocrates.

At King's College Hospital the Listerian Society held a meeting at which addresses were given on Lister by well-known surgeons, many of whom acted as Lister's house surgeons. Sir Watson Cheyne said there had been great statesmen, great generals, philosophers and religious teachers, whose influence and work had left an indelible

mark on the future happiness and progress of the human race; but the outcome of Lister's work was perhaps more widespread than that of any of these great men, and its influence on mankind was not limited to any country or race. Sir Watson described how Lister asked him to go to London and act as his house surgeon and also invited three other students. They looked on their selection as an unbelievable honor. Their only aim was to do their part of the work as carefully as possible and thus show unbelievers the truth of every claim made for Lister's methods. Lister missed in London the large number of students who believed in him. He thought Lister had struck a poor type of student at King's College Hospital and was unhappy about it. He found later that the secret of the supposed want of enthusiasm was that examining bodies did not favor Lister's methods, and the students were afraid to mention the subject; in fact, they were so afraid that they did not learn Lister's views until they had passed their examination. A good many remained to learn Lister's work.

Spread of Lister's Work

In the great hall of the British Medical Association the prime minister, Mr. Baldwin, received the delegates from foreign countries, oversea dominions, British universities, and institutions associated with medicine and science. The reception presented a brilliant scene as the representatives in academic dress were received. Sir Ernest Rutherford, president of the Royal Society, presided, and with him was Mr. R. G. Hogarth, president of the British Medical Association. Sir Ernest said it was not necessary to be a specialist to recognize what a debt the whole world owed to the discoveries of Lister and to his single-minded devotion to the cause of suffering humanity. As president of the Royal Society, an office which was filled with so much distinction by Lord Lister, and on behalf of the executive committee, he extended a cordial welcome to the delegates. He added that messages had been received from distant parts of the world, and he read congratulatory telegrams from the Imperial Academy, Tokyo, and the State Institute of Experimental Medicine, Leningrad. Professor Hartmann of Paris said that Lister had the merit of seeing the full advantage that could be taken of the experiments of Pasteur on fermentation for the treatment of wounds. He described how in 1868 a young Paris surgeon, Lucas-Championnière, visited

Glasgow, and on his return to France published an article on the Lister method, which he described as marvelous. France was one of the countries where Lister's method was most rapidly adopted. Professor von Gruber of Munich said that some of the most prominent German surgeons were among the first to appreciate to the full the greatness of Lister's invention and to help to force its way by conscientious application. After referring to the departure from Lister's original method he said that the fundamental perception of Lister, that wound diseases were infectious diseases, had remained unshaken. It was and would be the ground work of every kind of wound therapeutics. Above that, it had decisive biologic importance, for it had influenced their whole judgment of the processes of life.

Influence of Quaker Ancestry

A service was held in Westminster Abbey, where the scene was made picturesque by the brightly colored robes of physicians from universities in all parts of the world. These had assembled in the choir, and before the opening of the service a procession composed of about thirty representatives of the Royal Society, the Royal College of Physicians, and the Royal College of Surgeons, also wearing their robes, advanced from the cloisters to join them. Many had attended the memorial service of Lord Lister held at the abbey in 1912, but that was an occasion of mourning and there were no robes. The service was one of thanksgiving, in which Lister's achievements were again gratefully acknowledged and tributes were paid to the influence of Quaker training on his work. The anthem "When the Ear Heard Him" (Handel) was sung, and appropriate prayers were said. Dr. Barnes, F. R. S., bishop of Birmingham, in his sermon spoke of the religious principles that fortified Lister's character and guided his actions, the patient enthusiasm that served his genius. The persistence with which he pursued a single great aim throughout his career was remarkable. As a medical student at University College he read a paper on hospital gangrene; at the end of his professional life he was still endeavoring to perfect the practical details of the aseptic method. Where a lesser man might have been intoxicated by fame or made arrogant by the distinctions showered on him, Lister preserved a humility that was singularly attractive. He owed much to his Quaker ancestry. The great-grandfather whose name he bore was a Yorkshire Quaker of humble origin who came to London and

kept a tobacconist's shop. His grandfather became a wine merchant in the city and brought to prosperity a business which his father inherited. Perhaps it was not fanciful to see in the ability of Lister's father and in a touch of Celtic imagination derived from his mother, who was reputed to be of Irish origin, the source of his genius. Throughout his life Lister appeared to have retained the Christian faith of his childhood. When he married the daughter of Syme, professor at Edinburgh, he ceased to belong to the Society of Friends because she was not of that body; and he then became a member of the Scottish Episcopal Church. In youth he had been ready to discuss religious questions, but in mature life he, like most men, was reticent as to his spiritual beliefs. It was known that he combined the hope of personal immortality with faith in the goodness of the Creator, and when his life was drawing to its close he publicly expressed his conviction that "there is no antagonism between the religion of Jesus Christ and any fact scientifically established." The creed of a modern man of science was seldom a bundle of dogmas; it was rather an attitude of spirit. After discussing the results of Lister's work, the bishop said that sometimes in speculating on the future of humanity they thought of the highly evolved forms of life that lorded the earth in past ages. They disappeared, swept away probably by minute organisms. Was such an end to be the fate of humanity? Many a zoologist would answer "Yes." And yet man differed from all other animals. The theologian had justification in holding that the characteristic developments and powers of the human mind set man apart. He had a soul, some quality of personality of survival value in the scheme of the universe. Was it possible that, by virtue of these mental powers, man would conquer disease and pain and thus in the end prepare the way for a kingdom of God on earth?

Work as Physiologist, Bacteriologist and Surgeon

At the house of the Royal Society of Medicine, the work of Lister as physiologist, bacteriologist and surgeon was estimated by men eminent in those branches. Sir Ernest Rutherford, president of the Royal Society, occupied the chair. He said that Lister's discovery of antiseptic surgery was one of the most striking examples of the power of scientific methods in advancing knowledge. In Lister they had the most unusual combination of philosophic outlook and great

power of experiment, with a strong command of technic. Sir Charles Sherrington dealt with Lister's physiologic work. He spoke of his early papers on various muscles and on the coagulation of the blood, and said that almost from the outset he flung himself on what was to be his life work. He had enriched physiology with an advanced means for doing its work. He put into its hands for all time a superlative refinement of its methods and made possible observations that had hitherto been impossible. How could Pawlow have made his epoch-opening study of the digestive processes except by leaning on Lister's surgical principles? How could the physiologists of Toronto have discovered insulin but for Lister's methods? While helping man to mastery over disease, Lister contributed to free experimentation from the infliction of pain. Man, sacrificing animal life as he did for human need, had the right to regard the intellectual and moral impulse driving him to mitigate and dominate disease as justified in its resort to animal experimentation. He felt the more fully justified in so doing and took that step with a freer conscience, largely because, owing to Lister, it could be done without inflicting pain or causing suppuration.

William Bulloch of the London Hospital dealt with Lister's work as a bacteriologist. He said that the best of his scientific work was not done in any laboratory but at home in the early morning and late at night, before and after a harassing day's surgical work. The work of Pasteur came to Lister as a revelation, and almost at once he grasped its full significance for surgery. It was a vulgar error to regard him as a mere imitator of Pasteur. Four years before he knew of Pasteur's work he was getting extraordinarily near the truth as to the cause of suppuration, and he afterward advanced far beyond the point to which the Frenchman had led him.

Sir Berkeley Moynihan, president of the Royal College of Surgeons, said that the work of Lister had done for the craft of surgery what John Hunter did for the science of surgery. His earlier work owed a great deal to John Hunter. When he learned almost accidentally of the work of Pasteur, his mind was open to the new truth and almost expectant of it. His first attempt was to destroy within the wound the micro-organisms that caused putrefaction and decomposition. His later attempts were to destroy those organisms as they were about to enter the wound and ultimately to destroy them in the whole field of operation before they had a chance to enter the wound. The search for the perfect bactericide was still going on. There had

grown up in surgery a comparison of two methods—antiseptic and aseptic. They realized now that the conflict between the protagonists of the two was senseless and jejune. "I do not recognize the existence of aseptic surgery," said Sir Berkeley. "I have never performed an operation in which antiseptics were omitted. Aseptic surgery is only the sensible practice of antiseptic surgery. They do not differ in ideas but only in methods." The immediate result of Lister's work was the perfecting of the old operations. New operations also became possible, but the most marvelous feature of the advance made possible was that surgery became a great implement of research, how great was not realized even today by surgeons or physiologists. For a time the physiologist had gone astray and did not walk, as he should, hand in hand with the surgeon. The science of surgery was now so much in advance of the sciences on which it depended that until these caught up it must for a time be stationary. Surgery had rewritten the textbooks of medicine concerning the viscereal diseases. It had put into the hands of all a method, curiously neglected even to the present hour, of explaining most of the diseases that were still classed as medical. The influence that Lister's work might have on surgery was almost completed. They could hardly make surgery safer, but Lister's hypothesis, which governed the practice of surgery, was at least of equal importance in relation to medicine. Infection in medicine was responsible for a vast number of diseases, a number much greater than appeared to be realized. Here again there had been apathy.

The discovery of infections and their influences shown in 1900 by William Hunter had received far less attention than it deserved. Lister had done more than all this. The nations of the earth were ever at war. Were there not between them all bonds that should unite them so strongly that they could not be separated, and was there any bond between the nations so strong as that which Lister had forged? Had they not seen in London during the last few days a league of all the nations? Was it not possible that, because of their love for Lister and in the common reverent service to humanity which Lister made possible they might find a way to heal the wounds, not of men but of nations? If they could do that they might be the heralds of a new day when there should be no war, and then the Quaker spirit of Lister, which loathed the drums of war, might for ever be at peace.

SCIENTIFIC AND TECHNICAL ABSTRACTS

Dipridyl Oil—Nicotine, thus far practically unrivalled as an insecticide against plant lice, may soon have a serious competitor in the field through the results of experiments carried on at the U. S. Bureau of Entomology.

An oil prepared from pyridine, which forms an essential part of nicotine, combined with sodium, has been found to be poisonous to plant lice. Like nicotine it destroys the lice without injuring the infested plants. Entomologists believe it possible that dipridyl oil, as the new compound is called, may prove more effective than nicotine for the practical control of some injurious insects.

Thus far the economic phase of large-scale production of the new insecticide has not been thoroughly gone into, but it is believed that it can be made as cheaply as the manufacture of nicotine. Pyridine is obtained from coal tar distillation as a by-product and is largely wasted. The supply is great and the demand small so that it is fairly cheap. Sodium may also be obtained at low prices. The cost of the new product should, therefore, not exceed the cost of nicotine. Entering into the field as a rival, it may possibly bring down the price of nicotine.

It is difficult to find chemicals possessing sufficient toxicity to destroy plant lice and at the same time not injure the plants. The bureau experimented with sixteen other organic compounds whose toxicity was inferior as compared to dipridyl oil.

Elimination of Iodine—According to the authors iodides of the alkali metals, administered to animals in single massive doses per os, are eliminated in the urine almost quantitatively in a short period of time. The excretion of potassium iodide occurs within five to six days, and that of sodium iodide, in from three to four days. With both iodides the greatest proportion of the iodine is excreted during the first twenty-four hours. After this period the daily elimination is very small.

Potassium iodide seems to be eliminated by the kidney with greater difficulty than sodium iodide and sometimes causes tempo-

rary retention of iodine in the body. Only traces of iodine were found in the feces.

The results obtained for the elimination of calcium iodide were entirely different from those obtained with the iodides of the alkali metals. If it is administered per os, the major part, or at least 50 per cent. of its iodine content, is eliminated in the urine, while the remainder is found in the feces. As in the case of the alkali iodides, the greater portion of the iodine of the calcium-iodide is eliminated during the first twenty-four hours.—(F. R. Greenbaum and G. W. Raiziss, *The Jour. of Pharm. and Exper. Ther.*, Vol. XXX, No. 5, March, 1927.)

EXPLOSION DANGER OF AMMONIA-AIR MIXTURES—A broken cylinder of an ammonia compressor allowed quantities of ammonia gas into an engine room, causing an explosion and fire. Subsequent experiments showed that mixtures containing 17 to 27 per cent. by volume of ammonia at ordinary pressures can be exploded by a flame, generating pressure of six atmospheres, or about the same as in the case of hydrogen-air mixtures. Although rooms containing ammonia refrigerating apparatus do not require to be treated as rooms subject to explosion danger in the ordinary sense, still it is better to avoid the use of open lights in them.—(Leybold: *Das Gas und Wasserfach* 1927—I p. 40.)

SULPHUR AS A HEATING MEDIUM—Melted sulphur possesses many advantages over other materials as a heating medium. It is not subject to chemical change under the action of heat and covers a wide range of temperature between its melting and boiling points. It is inexpensive, non-toxic and not subject to material loss through vaporization. In its melted state it is not nearly as corrosive to steel and iron as is commonly supposed and is readily handled in contact with these metals.

From the foregoing figures it appears that practically any temperature between the melting point and the boiling point, or over a range of 324.6 degrees, may be maintained in an ordinary double boiler or jacketed container without the use of pressure. Convection currents are active in molten sulphur except in its viscous stage extending from about 160 degrees C. (320 degrees F.) to 250 degrees C. (482 degrees F.). It is therefore possible to use direct heat to the sulphur which transfers it uniformly to the inner container and its

contents. This is preferably done with gas or oil although coke or other readily controlled combustion materials may be used.

Cast iron, aluminum and chromium steel are practically unaffected by molten or boiling sulphur, and ordinary black iron or sheet steel is only slightly acted upon and for all practical purposes may be employed in installations where it seems advisable to use sulphur as a heating medium in a double boiler or other appropriate apparatus. —(Kobbe: *Jour. Chem. & Met. Eng.*, March, 1927, p. 163.)

RELATIVE TOXICITY OF CONTACT INSECTICIDES.—F. Tattersall, G. T. Gimingham and H. M. Morris ("Annals of Applied Biology," Vol. XII, p. 61 and p. 218; and Vol. XIII, p. 424) used adult black bean aphis (*Aphis rumicis*) and purple thorn moth eggs (*Selenia tetralunaria*) as test objects for obtaining quantitative results concerning the insecticidal values of plant products and organic chemicals. The toxicity of a number of plants, including some tropical fish poisons, was tested on *A. rumicis* in the form of aqueous or alcoholic extracts. The leaves and seeds of *Tephrosia Vogelii* were completely toxic in 1 per cent. solution in water or 0.1 per cent. emulsion of dried alcoholic extract. The roots and stems of white haiari and the stems of black haiari also possessed high insecticidal properties. The most toxic substance isolated was found to be identical with the tubatoxin of *Derris elliptica,* which was more potent than nicotine in its effect on *A. rumicis*. None of the other alkaloids tested approached nicotine in toxicity. As regards organic chemicals 2:4 dinitrophenol and 3:5 dinitro-*o*-cresol exhibited powerful insecticidal properties, killing eggs of *S. tetralunaria* with concentration between 0.1 and 0.2 per cent. The utility of these compounds as a winter spray is suggested (being injurious to foliage). Field tests confirm the high efficiency in the open against the eggs of hop-damson aphis on plum trees, no injury to the trees being observable. The strength of spray fluid was 0.15 to 0.25 per cent. of the dinitrocresol or its sodium salt, the latter showing slightly reduced toxicity. The most toxic naphthalene derivative was *a*-chlor-naphthalene. Toxicity increased with the introduction of a chloro, or nitro-group into the benzene ring, and a second nitro-group accentuated it still further.

English patent 261,055, by H. Maxwell Lefroy and the Græsser-Monsanto Chemical Works, states that the monohalogen naphthalenes kill flies and larvæ at such low concentrations as one part

per million by volume. It relates to production of lethal concentrations by volatilization from kieselguhr mixture or in sprayed hydrocarbon oil.

E. O. Essig (Bulletin No. 411, Agricultural Experiment Station, University of California, p. 1) recommends the use of *p*-dichlor-benzene for the destruction of root parasites on fruit trees. The applied dose averages one and one-half or two ounces for a ten-year-old tree. The solid substances is placed in a trench and covered with earth.

MEDICAL AND PHARMACEUTICAL NOTES

SANTONIN DISTURBS VISION.—Some things incite one to see red—santonin makes its victim see yellow. In experiments, reported in the *Journal of Pharmacology and Experimental Therapeutics,* Mr. Marshall, of the University of Aberdeen, Scotland, administered doses of santonin to an elderly man experienced in discriminating colors. Doses of a half gram or more caused objects to appear yellow to him within half an hour after the dose was taken.

The yellow vision was most noticeable on coming from a darkened room into daylight and was best seen through the windows viewed from a dimly lighted room. In diffuse daylight its intensity quickly diminished to a greenish-yellow veil. Artificial lights viewed in the evening seem a deep yellow in hue.

A chrome yellow color examined by the subject under the influence of the drug appeared to be deep orange, a light lemon color in shadow had the appearance of a dirty white suffused with a tint of violet.

It has not yet been determined just how the drug accomplishes its peculiar effect.

SAL ÆRATUS.—There is no question that the original Salæratus, anglicized in Saleratus, was an impure potassium sesquicarbonate, a mixture of potassium carbonate and bicarbonate. This was prepared by allowing "Pearlash," a pearly or granular form of K_2CO_3 to absorb additional CO_2. This process of manufacture was usually

carried on in the fermenting room of breweries, the old-fashioned breweries where beer was made by fermentation—the kind of beer which maks our, at least, my, mouth water when we think of those bygone days. Just as the old-fashioned beer, so the old-fashioned "Potash Saleratus" is at present unobtainable. Consequently today it is the common practice in pharmacies, drug stores, grocery stores, etc., to dispense Sodium Bicarbonate when Saleratus is called for.

Then there is another reason, an economic reason. Potassium bicarbonate is generally kept in pharmacies in the crystalline form, although it can also be obtained as a powder, and costs at wholesale about thirty cents a pound, while sodium bicarbonate only costs about four cents a pound by the keg. I pity the drug clerk who sells one pound of "Potash Saleratus," $KHCO_3$ and charges the customer sixty cents a pound and I pity him still more if he dispenses the crystals instead of the powder. These are things which you will never learn in College, but only by practical experience in a real pharmacy. It is practice that makes perfect.

I cannot subscribe to the statement by Prof. Brown on page 60 of the January *Journal of the American Pharmaceutical Association:* "Sal æratus means literally an 'Ærating Salt.'" This is not quite right. Ærating Salt—the present participle in Latin would be "Sal Ærans"—the salt for ærating. On the other hand Sal Æratus—the perfect passive participle—means "*Aerated* Salt"—the salt which has been ærated, namely, K_2CO_3 ærated with CO_2. The name refers to the process by which the salt is manufactured, not to the purpose for which it is used!

Last of all this little discussion again proves the value of knowledge, even superficial knowledge, of History of Pharmacy. It was for the object of promoting, in fact, popularizing this knowledge that the writer helped to organize the Society for History of Pharmacy, during his recent European trip, as fully outlined in the notice in the different pharmaceutical journals.

History is clarified experience (Lowell).—(From *Jour. A. Ph. A.*)

OTTO RAUBENHEIMER.

AN ANALYSIS OF A GERM.—Chemical analysis of the germ that causes tuberculosis has led to the discovery of a new type of compound, a phosphorus-containing fat, which has peculiar biological properties, according to Prof. R. J. Anderson of the Department of Chemistry at Yale University.

The tuberculosis bacterium is unique among single-celled organisms in being the possessor of a waxy covering which renders it highly resistent. This is why it can defy the phagocytes which police the body, for instead of being dissolved by them and destroyed, the T. B. organism survives and may multiply after being engulfed. The waxy sheath is so thick that it makes up one-fifth to two-fifths of the weight of the dried bacteria.

Prof. Anderson extracted eight pounds of the germs with a mixture of alcohol and ether to dissolve out this waxy coating. He obtained a pound of wax, half a pound of fat proper, and half a pound of phosphatide or phosphorus-containing, fatlike substance. The last material, to which he has given the name phosphosucride, is the most unusual constituent of the germs. It has been shown to contain phosphoric acid, a sugar, and fatty acids. "This compound differs from all other known phosphorized fats," Prof. Anderson stated. "It may be expected to have peculiar biological properties."

While the biochemist is busy probing the formula of the phosphosucride, other investigators are studying it biologically at the Rockefeller Institute for Medical Research, New York City, to determine to what extent the destructive powers of the tubercle bacillus are due to this element in its makeup, and whether once identified, it will be of service in the treatment or prevention of the disease.

Other chemists in an analogous way have obtained specific chemical compounds from penumonia bacteria, which show promise when applied clinically.—*Science Service.*

Toxicology of Methyl Alcohol.—The author's experiments indicate that the fatal dose of methyl alcohol for man is considerably under 120 to 240 gms. The view of Gadamer and of other toxicologists, that the poisonous action of methyl alcohol is to be attributed to acetone, formaldehyde, or other impurities, is erroneous; none of these impurities could be detected in samples submitted for examination. The extraordinarily slow oxidation in the body is characteristic of methyl alcohol, elimination not being complete until after three or four days. Hence the consumption of small quantities of methyl alcohol on successive days leads to its accumulation in the system, and will cause death. Under analogous conditions methyl alcohol is distributed through the system much more rapidly, and

can undergo oxidation within twenty hours after consumption. Methyl alcohol is stable in the dead organism for a very long time; thus it could be detected in a body six months after death. The natural occurrence of methyl alcohol in fermented liquors is a factor which has to be taken into consideration in deciding as to the significance of small amounts of methyl alcohol in spirits, and the author finds that it occurs as a normal fermentation product more frequently than is commonly believed. He was unable to detect it, however, in several samples of genuine brandy and rum. Kolthoff's method of detection (oxidation of the methyl alcohol in phosphoric acid solution and detection of the resulting formaldehyde by means of Schiff's reagent) is a more sensitive test than the method of Denigès (oxidation by means of acid permanganate). Smiedel's method, which is based on the oxidation of the methyl alcohol to formic acid by means of 1 per cent. alcoholic hydrogen peroxide solution in the cold, is not suitable for analytical practice. In Kolthoff's method the substitution of the phosphoric acid for the usual sulphuric acid causes the oxidation to proceed much more slowly, decolorization of the permanganate not being complete until after fifteen minutes, as compared with two minutes with the equivalent quantity of sulphuric acid.—*O. Windhausen* (*Chem. Ztg.*, 1926, 50, 588), through *Analyst*, 1926.

Should the Doctor Tell.—The oft-debated question, "Should a doctor tell?" was decided by the medical profession 400 B. C.

According to Dr. Walter Libby, of Pittsburgh University, in his book, "History of Medicine," recently published, Hippocrates, the father of medicine, based his system of professional ethics on an oath written long before his time in which the following occurred:

"Whatever in connection with my professional practice or not in connection with it, I see or hear, in the life of men which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret."

Dr. Libby traces the history of medicine from the priest physicians of Egypt and Babylonia up to the great war. He sketches the life work of great surgeons and physicians of many nations—Greek, Roman, Arab, French, Italian and German. One marvels not that that they knew so little but that they knew so much.

The Greek anatomist, Diocles, for example, in his work on zootomy, described the heart and large blood vessels; he knew

the oesophagus, the appendix, and the ureters, and he invented a head bandage and a spoon-like instrument used later to abstract arrow spears from wounds. He used opium and distinguished pleurisy from pneumonia.

Aristotle laid the foundation of comparative anatomy by dissecting about fifty species of animals and by performing many vivisection operations.

The Greeks procured criminals out of prison by royal permission, and dissecting them alive contemplated, while they were still breathing the parts which nature had before concealed. Apologists were found for the hideous practice, who held it by no means cruel to torture a few guilty to search after remedies for the whole innocent race of mankind in all ages.

The Romans had a R. A. M. C. of their own. Each legion had six surgeons, and every troop of 200 to 400 men on horseback. Each first aid carried a water flask and received a gold piece for every man he rescued.

An Arabian physician, Isaac Judaeus (850 A. D.), wrote a "Physicians' guide" in it remarking with experience:

"Visit not the patient too often, nor remain with him too long; unless the treatment demand it, for it is only the fresh encounter that gives pleasure."

One of the most interesting illustrations in Dr. Libby's book is a dissection of a female figure made by the supreme genius of his time—Leonardo da Vinci—who filled a book with drawings in red crayon outlined with a pen, all the copies made with the utmost care from bodies dissected with his own hand.

There were some good surgeons even in the Sixteenth Century. One Pare in 1552 amputated without cauterization the "leg of a gentleman hit by a cannon ball."

"I dressed him, God healed him, I sent him home merry."—*Goodrich Druggist.*

Iron in the Blood—Spinach and prunes have never yet had a serious rival in their healthful function of building up the body's supply of iron but recent research may result in putting more efficacious "iron pills" on the market to help people suffering from anemia.

Dr. Helen S. Mitchell, director of nutrition research at the Battle Creek Sanitarium, has been investigating many inorganic iron

compounds to find which are best utilized by the body to increase the iron in the blood. At the American Society of Pharmacology meeting here this morning she reported that iron combined with iodine would cause only a temporary rise in the hæmoglobin content of the blood of anemic rats. Certain other compounds of iron, however, Dr. Mitchell stated, were found to give better results than those in current use for this purpose.

For the benefit of pharmacists and physicians she has classified the list of iron compounds that can be used medicinally into good, fair and poor, according to the ease with which the iron can be taken up by the blood.—(*Science Service.*)

CANCER NOT GERM DISEASE, GERMAN EXPERTS DECLARE.—Carcinoma, one of the principal types of cancer, is not caused by a specific germ, a group of cancer specialists in session here with the Association of German Natural Scientists and Physicians have declared. This was their unanimous conclusion, reached independently of the similar decision recently published by American experts, and thus reinforcing the opinion of their transatlantic colleagues.

Germs as a provocative or predisposing cause were admitted to be possibilities by Prof. Max Greil, of Innsbruck University. Microorganisms, he declared, "dynamically determine" the incidence of cancer by upsetting the normal physiological condition of the body or at least of the tracts where the disease occurs. He concurred in the opinion of the other delegates, however, that it is useless to search for a specific parasite responsible for all cases of carcinoma.—*Science Service.*

SKIN RASHES CAUSED BY MANY SUBSTANCES.—Effects like those of poison ivy are produced on the skin of many persons by a strange diversity of substances, Prof. Max Touton of the University of Wiesbaden, has reported to the Association of German Natural Scientists and Physicians. Such skin rashes must be listed among industrial and professional sicknesses, for they frequently affect workers after a long period of handling materials that at first are harmless and only begin to show their ill effects when a condition called "anaphylaxis" has been established in the patient.

Practically everybody in the Braunschweig district, the center of the German asparagus packing industry, gets poisoned by the

vegetables. In the great German drug houses, packers are given the skin disease by such drugs as squills, which is commonly employed only for mild internal medication. Violin players are poisoned by the rosin they use on their bows, flute players by the grenadilla wood of which their instruments are made, and hairdressers by the quinine in their tonics.

As in the case of ivy poisoning, the victim does not gain immunity after one attack, but instead becomes even more sensitive. Efforts to build up resistance on the part of the victims by inoculating them with small doses of the trouble-causing substances have met with at least partial success.

SODIUM THIOSULPHATE IN THE TREATMENT OF POTASSIUM CYANIDE POISONING.—Martínez' patient had taken an unknown quantity of potassium cyanide. Intravenous treatment with 30 per cent. sodium thiosulphate was instituted shortly afterward. Improvement was almost immediate. Two injections, of 10 cc. each, were given Cardiac tonics and dextrose solution were also used—*Semana Médica, Buenos Aires,* 34: 129-192 (Jan. 20), 1927, through *Jour. A. M. A.*

POISONOUS HONEY—Poisonous honey of the same kind that aroused the wonder of the ancient Greeks is still to be found in northern Asia Minor, according to a physician-scientist who recently returned from a journey through that region. The honey, which was first mentioned by the soldier-historian Xenophon and later described by the philosopher-scientists Aristotle and Dioscorides, still has much the same effects upon those who eat it as it had in the days of classical antiquity. According to Dr. Krause's description, based on personal experiments with the poisonous sweet, it causes a giddiness and sometimes a brief loss of consciousness, followed by a short period of general malaise, "as though one had been on a spree," he says. Where the bees get the toxic nectar is still an unsettled question, but suspicion settles most strongly on two species of rhododendron abundant in the region, whose foliage is known to be poisonous to cattle.—(*Science Service.*)

NEWS ITEMS AND PERSONAL NOTES

DR. PITTENGER WITH SHARPE & DOHME—Dr. Paul S. Pittenger, instructor in Biologic Assaying at the Philadelphia College of Pharmacy and Science and Temple University, entered the service of Sharp & Dohme, manufacturing chemists, Baltimore, Maryland, on April 1st this year, assuming charge of their research pharmacological laboratories.

Dr. Pittenger is a member of the General Committee of Revision of the Pharmacopœia of the United States, and of the sub-committees on Biological Assays and Biological Products and Diagnostical Tests.

His researches upon the bio-chemistry of drugs have attracted wide attention, and he is the author of a textbook on "Biochemic Drug Assay Methods."' He is a member of various professional and scientific societies and a frequent contributor to scientific literature.

AMERICAN PHARMACEUTICAL ASSOCIATION COMMITTEE ON RESEARCH.—The American Pharmaceutical Association has available a sum amounting to $500 which will be expended after October 1st, 1927, for the encouragement of research.

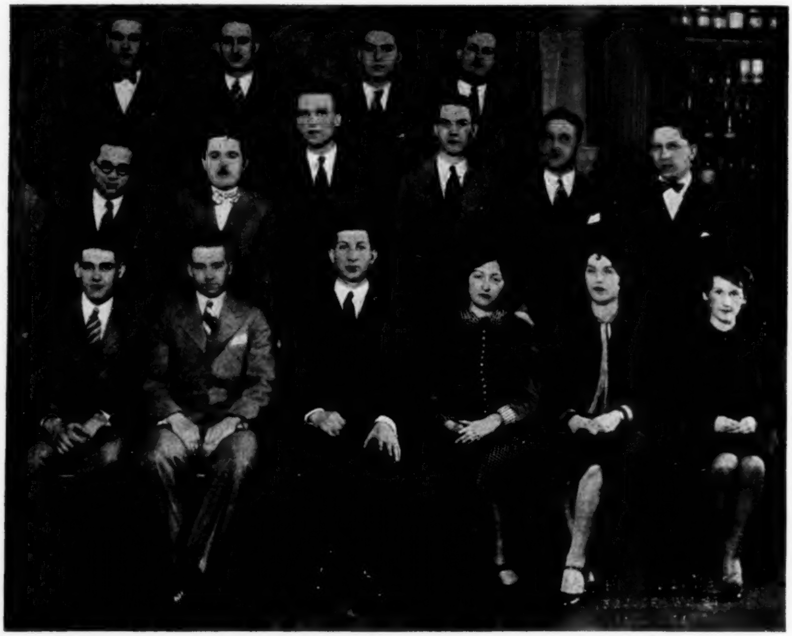
Investigators desiring financial aid in their work will communicate before July first with H. V. Arny, Chairman, A.Ph.A. Research Committee, 115 West Sixty-eighth Street, New York City, giving their past record and outlining the particular line of work for which the grant is desired.

THE HEADQUARTERS BUILDING VOTE.—The following cities have received the highest vote in the order named in the second ballot on the location of the Headquarters Building of the American Pharmaceutical Association:

Washington, D. C.;
Chicago, Ill.

The names of these cities will appear on the ballots which will be sent out on June first, and the one receiving the greater number of votes in this ballot will be the location of the building.

Student Council of the Philadelphia College of Pharmacy and Science.—The Philadelphia College of Pharmacy and Science is justly proud of her student council which has been a great factor in making the honor system an assured success at the College. The Philadelphia College of Pharmacy and Science is the first institution of its kind to inaugurate such a scheme of absolute trust in the honor and sportsmanship of her students.



STUDENT COUNCIL

Lower Left to Right—Ray Evans, Alfred Burr, Lewis Ed. Miller, Miss Rose Barkan, Miss Florinel Whalen, Miss Helen Harrel.
Middle—Louis Jaffe, Edward Rees, Arthur Osol, Thomas Blanford, Charles W. Moyer, Joseph De Visia.
Top—Harry Steinhouse, Joseph Chankin, Irving Burnett, Max Kaigh.

There is thus instilled into the budding Pharmacist a sense of honesty and honor, the strict practice of which he owes to the oldest and most honorable profession, the practice of Pharmacy.

To Fight Menacing Epidemic in Wake of Mississippi Flood.—"No man can exaggerate the seriousness of what is taking place in the great valley of the Mississippi," declared Henry M. Baker, National Director of Disaster Relief for the American Red

Cross. "Our greatest menace is typhoid fever, and the next more grave problem will be measles, scarlet fever, and enteric disorders."

With quick realization of what the needs of the Red Cross would be in this dire emergency, the drug trade was among the first to respond to the national appeal for help, and typhoid serum, disinfectants, and other medical supplies were rushed forward to the flooded area.

Supplies of Creolin Pearson donated by Merck & Co. were dispatched to their wholesale distributors from St. Louis to New Orleans, with the request that this disinfectant be placed at the disposal of the local chapters of the American Red Cross.

Creolin has previously played an important part in warding off threatening epidemics—notably after the tropical hurricane which devastated southeasten Florida last year, and also after the disastrous Galveston flood of 1900.

United States Civil Service Examination.

The United States Civil Service Commission announces the following open competitive examination:

Inspector, Anti-Narcotic Act.
Agent, Anti-Narcotic Act.

Applications for inspectors and agents, Anti-Narcotic Act, must be on file with the Civil Service Commission at Washington, D. C., not later than May 31.

The examinations are to fill vacancies in the Bureau of Prohibition, and in positions requiring similar qualifications.

The entrance salary for these positions will range from $2100 to $2500 a year, depending upon the qualifications of the appointee as shown in the examination and the duty to which assigned. Promotion to higher salaries may be made in accordance with the civil service rules as vacancies occur. Employees are allowed subsistence and actual necessary traveling expenses when away from post of duty on official business.

The duties of inspectors will consist of the inspection of records of manufacturers and importers of and wholesale and retail dealers in narcotic drugs and investigations of illicit traffic therein; also those of practitioners of medicine and manufacturers and dealers in preparations exempt under the Harrison Narcotic Act, as amounded by the Revenue Act of 1918 and amendments thereof approved February 24, 1919.

The duties of agents will consist of the investigation of illicit traffic in opium and coca leaves and their salts and derivatives, and the securing of evidence of such violations.

Competitors will not be required to report for written examination at any place, but will be rated on their training and experience. Competitors attaining an eligible rating on training and experience may be required to report for oral examination which will be held at points as convenient for candidates as conditions will permit.

Full information may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the Board of United States Civil Service Examiners at the post office or custom house in any city.

Correct Diagnosis the First Step.—There is perhaps no line of medical practice in which correct diagnosis is more important and essential as a first step than in the handling of patients suffering from hay fever, asthma, and other forms of protein sensitization.

And, the first step toward diagnosis is to have a suitable assortment of diagnostic test material. One of the most convenient and practical outfits we have seen for this kind of work is put out by one of the manufacturing biological laboratories in the form of a test case which contains sixty different animal, food and pollen proteins, all conveniently arranged on a test board so as to facilitate recording the various proteins applied. With such a case at hand, the physician can have a place for each protein and each protein in its place.

The proteins are in dried powder form, sufficient for 25 tests of each of the 60 varieties, or a total of 1500 tests. Individual proteins may be obtained to replenish the case, as required.

With such an outfit at hand, the physician can readily make the necessary tests to establish diagnosis, and the results of such tests, in conjunction with the history of the case and a knowledge of the local conditions, will aid greatly in planning a course of treatment.

If the offending pollen or protein cannot be avoided, desensitizing treatment with pollen or protein extracts may be employed with success in a majority of cases.

If you are interested in a test case of this kind, we suggest that you communicate with H. K. Mulford Company, Philadelphia, Pa., and ask them for a description of Diagnostic Test Case No. 60.

BOOK REVIEWS

The Romance of Chemistry. By William Foster, Ph. D., Professor of Chemistry in Princeton University. Author of "Introduction to General Chemistry" and "The Elements of Chemistry." Illustrated. 12 mo., 468 pp. Cloth, $3. The Century Co., 353 Fourth Ave., New York City.

Professor Foster, well known in chemical circles, herewith presents a new and complete and delightfully written story of modern chemistry. He tells the story of alchemy, of electrons, atoms and molecules, of oxygen, fire and flame, of the elements, metals and minerals and of everything else pertaining to chemistry. Special chapters are devoted to The Dependence on Chemistry by the Farmer, the Housewife, the Manufacturer and the Physician. To the advantage of the book a chapter might be added "Dependence on Chemistry by the Pharmacist." Theory and practice are both easily and fascinatingly explained and the author has fully succeeded in linking chemistry with the ordinary life of the world. His anecdotal, pictorial style of writing brings Drama out of Science. Pharmacists should become interested in this splendid book.

Otto Raubenheimer, Ph. M.

The Romance of the Atom. By Benjamin Harrow. 12 mo. 162 pp. Cloth, $1.50. Boni & Liveright, Inc., 61 W. 48th St., N. Y. City.

The well-known author of "Eminent Chemists of Our Time," of "Vitamines," of "Glands in Health and Disease," of "What to Eat in Health and Disease" and of "An Introduction to Organic Chemistry," herewith presents, in non-technical language, but with strict regard for accuracy, the glorious achievements of chemists in unraveling some of the profound mysteries hidden within the Atom.

The Romance of the Atom begins with Alchemy and the Dawn of Chemistry, to Priestley and the Dawn of Modern Chemistry, to Mendelieff, Crookes, the Electron, Madame Curie, up to the Work of Rayleigh and Ramsay and the Application of the Structure of the Atom by Irving Langmuir. The concluding chapters deal with the Origin of Life, the Application of Science to Everyday Life and the Scientist as Citizen.

Harrow herewith presents a book that combines in an ideal way scientific exactness with vivid narrative. Read it and be convinced.

Otto Raubenheimer, Ph. M.

PRAKTIKUM DER KLINISCHEN, CHEMISCHEN, MIKROSKOPISCHEN UND BAKTERIOLOGISCHEN UNTERSUCHUNGSMETHODEN. Von San-Rat Dr. M. Klopstock und Dr. A. Kowarski in Berlin. 8 auflage, 509 pp. Mk. 13.50. Urban & Schwarzenburg, Friedrichstr, 105 B., Berlin N.

When a book is published in its eighth edition it must have value. The authors present in twelve chapters the clinical methods, chemical, microscopical and bacteriological, of secretions of the mouth, gastric contents, fæces, urine, blood, etc.

Chapter VII on Urine comprises 126 pages and is very thorough. It has been the aim of the authors to simplify methods both as to apparatus and technic. Pharmacists who do this kind of work will find this book a very valuable help indeed.

OTTO RAUBENHEIMER, Ph. M.

MODERN SCIENCE AND PEOPLE'S HEALTH. Edited by Benjamin C. Gruenberg, 8 mo., 250 pp. Cloth, $2.50. W. W. Norton & Co., Inc., 70 Fifth Ave., N. Y. City.

Norton books are the publications of the only general publishers devoting their activities entirely to non-fiction books. The volume before us contains the story of what science is doing for people's health. An *anatomist,* Dr. Chas. R. Stockard, of Cornell University Medical College, tells of what he has learned about heredity and environment. A *chemist,* Prof. Hugh S. Taylor, of Princeton University, speaks of the drugs that science has created for the prevention and cure of disease. A *physiologist,* Prof. Walter H. Eddy, of Teachers College, Columbia University, relates the principle of diet and proper nutrition and such new discoveries as vitamines and insulin. A *psychiatrist,* Dr. Wm. A. White, superintendent of St. Elizabeth's Hospital, Washington, D. C., tells of the fitting of human beings into the complex and trying conditions of our artificial life today. A *bacteriologist,* Dr. C. E. A. Winslow, Professor of Public Health at Yale University, reviews the fight to control communicable disease. A former *public health official,* Dr. Marvin Emerson, of Columbia University, summarizes how these experimental sciences improve the quality of our health, lengthen life and make it secure. To duly appreciate this book it must be read.

OTTO RAUBENHEIMER, Ph. M.